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is issued as a medium for the dissemination of information received by the World Reporting Service on Plant Diseases and Pests, established in accordance with the provisions of the International Plant Protection Convention, 1951. It publishes reports on the occurrence, outbreak and control of pests and diseases of plants and plant products of economic significance and related topics, with special reference to current information. No responsibility is assumed by FAO for opinions and viewpoints expressed in the Bulletin.

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FAO Plant Protection Bulletin

Vol. II, No. 6 A Publication of the March 1954

World Reporting Service on Plant Diseases and Pests

Insect Pests in British Colonial Dependencies: A Half Yearly Report [1]

W. J. Hall

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ASIA

Singapore

The onion leaf miner, *Dizygomyza cepae* Hering (Dipt. Agromyzidae), is still to be found, but on a greatly reduced scale.

Artona catoxantha (Hmps.) (Lep. Zygaenidae), the larvae of which attack the foliage of coconut palms, usually appears during the dry weather and was rather more prevalent than in recent years. It is now controlled satisfactorily by the weather and by the parasite *Ptychomyia remota* Aldr. (Dipt. Tachinidae).

AFRICA

Nigeria

The pink bollworm, *Platyedra gossypiella* (Saund.), (Lep. Gelechiidae) which was first recorded from Nigeria in 1944, caused serious damage in the Western Region, where the rate of attack was 30 to 35 percent in 1952–53.

Sorghum, millet and maize suffered severe damage in 1952–53 from lepidopterous stem borers, including *Busseola fusca* (Fuller) (Noctuidae), *Eldana saccharina* Wlk. (Pyralidae) and *Proceras ignefusalis* Hmps. (Pyralidae), while *Rhinaphe vectiferella* Rag. (Pyralidae) occurred on rice.

The sorghum midge, *Contarinia sorghicola* (Coq.) (Dipt. Cecidomyiidae) was recorded for the first time in Nigeria near Ibadan in 1952–1953. This fact has already been recorded in a footnote to a paper by Geering [2]. The insect was recorded from the Anglo–Egyptian Sudan in 1936, and more recently from Uganda, Kenya, Tanganyika, Nyasaland, Gold Coast and the Gambia. Geering concludes that it is likely that all the main sorghum–growing areas of Africa will prove to be infested. It is also widespread in the United States and the West Indies, and has recently been reported from Venezuela.

Populations of the cacao mirid, *Sahlbergella singularis* Hagl. (Hemipt. Miridae) have increased in Ibadan Province.

In the field of control, damage by *S. singularis* and *Distantiella theobroma* (Dist.) (Hemipt. Miridae) was effectively reduced by a DDT dust applied with portable motor–dusters.

Mauritius

A brief review of the plant pest situation in Mauritius has been received. Sugar cane is the crop on which the economy of the island depends. The importance of the introduced *Clemora smithi* (Arr.) (Col. Melolonthidae) has been reduced by biological control and the extensive cultivation of a resistant variety of cane. The chief pest of sugar cane is now considered to be *Proceras sac-*

[1] The present report covers the period from July to December 1953.

[2] Geering, Q. A. The sorghum midge, *Contarinia sorghicola* (Coq.), in East Africa. *Bull. Ent. Res.* 44:363–366. 1953. (Abs. in *Rev. Appl. Ent.* Ser. A. 41:318–319. 1953.)

chariphagus Boj. (Lep. Pyralidae). Biological control has given no appreciable results to date. *Sesamia calamistis* Hmps. (Lep. Noctuidae) and *Argyroploce schistaceana* Snell. (Lep. Olethreutidae) are also important. *Apanteles sesamiae* Cam. (Hym. Braconidae), introduced from East Africa against the former, shows some promise.

Seychelles

Melittomma insulare Fairm. (Col. Lymexylonidae) is the only major pest of coconut plantations, and is a great threat to the industry. Research on biological control has so far been unsuccessful. Encouraging results have recently been obtained with fumigants, especially paradichlorobenzene, and an extensive control scheme using this substance has been planned. A detailed study of the pest will shortly appear in the *Bulletin of Entomological Research* in early 1954.

PACIFIC ISLANDS

New Hebrides

It is stated that a regulation is shortly to come into force, instituting measures to prevent introduction of the rhinoceros beetle, *Oryctes rhinoceros* (L.) (Col. Dynastidae).

BRITISH WEST INDIES

Jamaica

A rather severe outbreak of the West Indian cane fly, *Saccharosydne saccharivora* (West.) (Homopt. Delphacidae), occurred early in 1953 on a 30–acre area of sugar cane. It was hoped to bring it under control with insecticides, but by August 1953 the outbreak had increased greatly in extent and severity. Six hundred acres of young cane have been sprayed with insecticide, leaving the high cane to form a reservoir for parasites and predators. Longer–term biological methods are being planned.

Dominica

An outline of existing major pests has been received. This includes pests of the following crops:

Citrus. Soil treatment trials with aldrin in nursery beds have shown some promise in controlling the citrus weevil, *Diaprepes abbreviatus* (L.) (Col. Curculionidae). The fruit–piercing moth, *Gonodonta incurva* Sepp (Lep. Agrotidae), causes serious damage and is an obstacle to the whole fruit industry. The possibility of biological control has been investigated. The orange moth, *Gymnandrosoma* sp. (Lep. Tortricidae) is a potential danger. The larvae bore in the fruits.

Banana. The only pest of importance is the banana borer, *Cosmopolites sordidus* (Germ.) (Col. Curculionidae). Biological and insecticidal methods of control have recently been investigated.

Coffee. The coffee leaf miner, *Leucoptera coffeella* (Guér.) (Lep. Tineidae), constitutes a formidable obstacle to a revival of coffee growing. The possibility of biological control is under consideration.

St. Vincent

A report for the first half of 1953 received too late for inclusion in the summary for that period mentions considerable defoliation of arrowroot by the leaf–roller, *Calpodes ethlius* Cram. (Lep. Hesperiidae). The outbreak was brought under control by arsenical sprays, and final crop yields were not seriously reduced.

Results of Aerial Spraying Against Spruce Budworm in New Brunswick, Canada

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IN 1953 about 1,800,000 acres of forest heavily infested by the spruce budworm with severe defoliation in northern New Brunswick were sprayed aerially by Forest Protection Ltd. The details of the operation were reported previously by Flieger[1]. The airplanes were flown in pairs and the average distance between flight lines was doubled to give half the dosage per acre. This permitted more rapid coverage to check feeding before the new foliage was destroyed. More emphasis was laid on the protection of the trees and less on killing a high percentage of the larvae since experience gained in 1952 indicated this would probably be largely nullified by moth invasion. As it was considered necessary to respray only 400,000 acres of the 1953 acreage at a total of 1 gallon per acre, the final cost per acre was much reduced.

Studies of development, population trends, and defoliation were made on the Upsalquitch, Charlo, and Tobique watersheds by crews under the direction of F. E. Webb. and on the Green River and Kedgwick watersheds by the staff of the Green River Project under R. F. Morris. Check areas were reserved on the Charlo and Green River and proved to be closely comparable with the sprayed areas as to infestation history and population, all having more than enough larvae before spraying to destroy the new growth completely. A total of 98 plots was used. Most of these were sampled at two– to three–day intervals from early larval stage to moth emergence. On the Green River the work was confined to a pre–spray larval sample and a post–spray pupal sample.

[1] FLIEGER, B. W. Aerial spraying for controlling spruce budworm in New Brunswick, Canada, 1953. *FAO Plant Prot. Bull*: 2: 68–70. 1954.

Effects on Insect Mortality

Percentage mortality of the budworm from spraying was calculated to eliminate as accurately as possible the effects of natural control factors. The method requires comment. Abbott's formula[2], which was tested, is based on the assumption that percentage mortality would be equal regardless of the initial population. Spraying has been undertaken in New Brunswick when the population was generally well above the level necessary to destroy the new foliage completely. With a limited food supply for the immature larvae, survival may vary inversely with the initial population, so that Abbott's formula could give misleading results. For this reason it is highly desirable to have control plots that do not differ significantly from sprayed plots in initial population and infestation history. When pre–spray sampling indicates these conditions are fulfilled, mortality from spraying can be calculated from relative survival on sprayed and unsprayed areas. It is convenient to base this on sampling in the more static pupal stage, and the counts of "emerged" pupal cases will reflect both the direct effects of the spray and the indirect effects due to changes in population density between spraying and moth emergence. All control percentages listed below are based on pupal population in sprayed and check areas.

Results in 1953 were influenced by late frosts, which destroyed opening buds ranging on the plots from 80 percent in the Green River–Kedgwick area to 35 percent on the

[2] Abbott's formula: $\frac{x-y}{x} \times 100 = \%$ mortality from treatment, where $x = \%$ survival in untreated population and $y = \%$ survival in treated population.

Tobique, 10 percent on the Charlo and little or none on the Upsalquitch. Where this was severe, the destruction of remaining new shoots by young larvae was rapid and the mortality of the insect from starvation high; thus fewer shoots survived and the number of larvae killed by spray was lower.

Mortality of the larvae from spraying varied also with the time and number of applications. In the Green River–Kedgwick area, where frost damage was high, this averaged 87 percent (range 75 to 100 percent on plots ¼ mile apart) with one application and 93 percent (range 91 to 97 percent) with two applications. On the Tobique two applications three weeks apart gave an average spray mortality of 97 percent (range 93 to 99 percent). Plots on the Charlo, which were sprayed once relatively late, showed 99 percent killed. It should be noted that all plots received some drift on dates other than those of scheduled spraying. Part of the Upsalquitch area sprayed in 1952 was resprayed in 1953 at ½ gallon per acre. Plots in this area were treated early but owing to proximity to the airstrip received drift on several occasions between 30 May and 29 June. When compared with plots sprayed in 1952 but not in 1953, they showed 94 percent killed (range 84 to 99 percent).

Spraying was timed to commence when the needles had begun to flare, usually shortly after the peak of the third instar. It was found that the change of color of the trees at this stage could be detected from the air and aerial surveys were used to give additional information on foliage development in more inaccessible areas. The highest kills occurred, however, where spraying was latest and larvae most exposed. Thus the optimum spraying time must be a compromise between early spraying to protect foliage and late spraying to obtain maximum kill.

Effects on Foliage Protection

The degree of protection from defoliation was estimated by measurements on sample branches and by estimates on standing trees. The percentages of foliage surviving did not generally exceed 10 on the Green River and ranged from 25 to 70 on the other areas. Feeding on old foliage was more or less negligible on sprayed areas, especially after early spraying. On unsprayed areas new growth was practically completely destroyed and feeding on old foliage was noticeable. The largest amount of new growth surviving (70 percent) was on the area sprayed both in 1952 and in 1953 (½ gallon per acre). In the area sprayed only in 1952 approximately 45 percent of the new foliage survived the 1953 feeding and its much improved condition indicates that preservation of quite small proportions of the new shoots in 1952 was of great value in promoting recovery.

Studies of moth flight by means of 25 light–traps and extensive egg surveys were carried out with the assistance of Forest Protection Ltd. Over 800 locations were sampled for eggs in sprayed and adjacent unsprayed forests of northern New Brunswick. In brief, this showed that the reinfestation of sprayed areas was general although less than in 1952. The average number of egg masses per 100 square feet of foliage was 242 on the sprayed areas and 566 on unsprayed areas. Past records of egg populations in relation to loss of new foliage the following year suggest that over 200 masses per 100 square feet may result in the loss of 70 percent or more of new foliage but it should be noted that an average of 312 masses on the Upsalquitch in 1952 did not result in sufficient defoliation in 1953 to prevent good recovery of the trees.

Effects in Population Trends of the Budworm

There is no evidence of a decline of the budworm outbreak in New Brunswick as a result of the spraying operations. The severely infested area approximately doubled in 1953.

The long–term results must be determined by the long–term studies that have been initiated. The limited data obtained so far do not permit a definite statement on the effects of spraying on parasites. Parasitism is not at present adequate to control the outbreak and there is no evidence as yet that this factor of natural control has been eliminated in sprayed areas. However, the effect of spraying on the long–term trend of populations is a complicated question that

can be answered only by time and intensive research.

Consideration of the Spraying Plan

The general policy of postponing spraying until the degree of defoliation and the number of eggs indicate the possible extent of foliage losses from next year's attack is a sound one, as it will take the best advantage of natural control and tend to avoid unnecessary spraying. The problem of determining just when this stage has been reached is complicated by variations in the amount of feeding on old foliage. The quantity of old foliage consumed is controlled by the number of larvae that survive to the last feeding instar, which is best able to eat the old needles. It is also influenced by the age of the old foliage available to the larvae, which depends upon the amount of previous defoliation. In 1953 some stands that were first severely attacked in 1952 showed "back–feeding" amounting to destruction of several years' growth of old needles, thus bringing the trees to the danger point after only two years' attack. Rapid defoliation of this kind has not previously been observed in the present outbreak and may be unusual but it illustrates the difficulty of forecasting the rate of foliage loss. Spraying plans must also take into consideration the operational problems such as the minimum area that can be efficiently sprayed from one airstrip and the maximum area that can be handled in any one year.

The new technique of doubling the distance between flight lines was justified by results this year. Satisfactory coverage seems to have been obtained as a result of drifting of the smaller droplets in the spray cloud. The results, together with experimental work elsewhere, suggest that the effectiveness of the spray is related to the number rather than the size of the droplets. Considering the probability of reinfestation, ½ gallon per acre, when applied after the larvae were well exposed, gave almost as satisfactory control as 1 gallon. However, since it will probably never be practicable to delay spraying until the optimum time, in a large operation, some respraying of the earlier–treated areas may often be necessary.

Sugar Beet Curly-Top Virus and Curly-Top Disease in the United States

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THE North American curly–top virus (*Ruga verrucosans* Carsner & Bennett; *Beta* virus 1 K. M. Sm.) is a serious menace to the sugar beet and many other cultivated plants throughout the area from the Rocky Mountains westward. It occurs also, but is usually much less important, in the region immediately to the east of this area.

This virus had not been identified elsewhere in the United States until 1953, when it was reported to occur in Illinois. Because of its destructiveness to a very large number of crops, proof of its presence and the possibility of its spreading in Illinois, which is in the central part of the country and far distant from the region of general occurrence, is of great importance to the surrounding area.

In addition to its occurrence in Illinois, some other reports of unusual interest with regard to the prevalence of the curly–top disease and reactions of some ornamental plants to the virus were received in 1953.

Occurrence of Curly-Top Virus in Illinois

The occurrence of the curly–top virus and of the curly–top disease on sugar beets in Illinois was established in 1953. The known insect vector of the virus, *Circulifer tenellus* (Baker), was collected from horseradish in the East St. Louis area in July, and in Madison County in August. The presence of the virus in specimens of the insect from the latter source was demonstrated.

Previously the leafhopper, *C. tenellus*, had been found in abundance in horseradish plantings in Illinois. Its occurrence was regarded as being unusual and interesting and its association with a disease condition of horseradish similar to the sugar beet curly–top was noted. But neither the presence of the curly–top virus in the insect nor its relation to the horseradish disease was established at that time.

Sugar beet plants suspected of having the curly–top disease were detected in August just north of Chicago in Cook County and from some of these plants the curly–top virus was recovered. In the same county, sugar beet plants with symptoms typical of curly–top were observed in October, as many as 5 percent of the plants being affected in some fields. In other fields, though plants with typical symptoms were not observed, many plants showed curled young leaves without vein clearing or enlargement. The vector was present in these fields.

Cucumber plants growing adjacent to a horseradish planting in Madison County also showed symptoms suggestive of curly–top on cucumber. Other curly–top susceptible species of plants growing in or adjacent to horseradish fields in Madison County did not reveal recognizable symptoms of curly–top. Failure to recognize symptoms in these plants may have been due to unfamiliarity with symptoms of the disease and to the effect of the drought upon plant growth.

Relation of Curly-Top Virus to Horseradish Brittle Root

The horseradish brittle root disease, as recognized by growers in Illinois, appears to be related to a complex of causes one of which may be the sugar beet curly–top virus. Occurrence of the disease in the East St. Louis area in 1953 was apparently favored by severe drought and high temperatures during the growing season, and an estimated crop loss of approximately 80 percent in the Madison

and St. Clair Counties was attributed to the disease. In Cook County, the other primary horseradish growing area in Illinois, the disease was of little consequence, although it was observed on a few plants. Only a few leafhoppers were detected in horseradish and sugar beet fields in Cook County throughout the season.

In Champaign County the leafhoppers were found on experimental horseradish plants in July and were collected from horseradish plants throughout the season. Although horseradish has been grown in the experimental plantings continually since 1949 and intermittently since 1938, recognizable cases of brittle root disease were observed for the first time only in 1952.

Late in October 1953, a few horseradish plants in Peoria County were observed to have brittle root. The curly–top vector was also present. Two farmers, the only known horseradish growers in the area, claimed that the disease had been present for only the past two years. As these growers used their own sets and had not obtained sets from plants grown elsewhere, it would appear that the disease was not introduced by means of set roots carrying the causal agent. The origin of the disease in the area is not known.

The curly–top virus vector appeared to be present throughout Illinois in 1953, since known occurrence included widely separated locations in the southwestern, central, east central, and northeastern parts of the State. There was a distinct relationship between leafhopper population and prevalence of the horseradish brittle root disease. Wherever brittle root occurred, the leafhopper was also present. However, actual transmission by the curly–top virus vector of the causal agent of brittle root disease has not been established.

Epiphytotic of Sugar Beet Curly-Top in Kansas

Curly–top of sugar beets, though previously seen in Kansas, was of little, if any, economic significance until 1953 when a severe epiphytotic occurred in the Garden City–Scott City irrigated growing areas.

Typical symptoms of the disease were seen on plants in all fields examined. Due to decreased stand and small beets, yields were reduced by approximately 50 percent. The percentage of plant infection was possibly 75 to 80 percent or more. No curly–top resistant varieties were being grown in the area.

The vector, *Circulifer tenellus*, was found in some abundance in the area at different times. Viruliferous leafhoppers were possibly blown in from the southwest during the spring high winds.

Reactions of Flowering Ornamentals to Curly-Top Virus in New Mexico

During the last decade the curly–top virus has been responsible for appreciable crop losses in southern New Mexico. Climatic conditions and the abundance of susceptible native plants and weeds afford ideal conditions for the production of a large viruliferous population of the insect vector. Gardeners in southern New Mexico have complained of their inability to grow certain annual and perennial ornamental flowering plants. In most instances, the trouble has been traced to the Curly–top virus.

The reactions of 33 ornamental flowering plants, including species and varietal forms, in 11 families were tested in the 1952–53 season. Approximately four dozen plants of each variety were transplanted from cold frames to the field in early March, 1953, in an extensive randomized trial. The trial was carried out on a newly–cleared plot of land completely surrounded by *Atriplex canescens*, a native curly–top susceptible host plant. The very mild winter of 1952–53 also resulted in an extremely high population of the beet leafhopper and afforded ideal conditions for disease dissemination. No attempt was made to control the leafhopper after transplanting.

Final disease notes were taken on 20 May 1953, when most of the susceptible plants had succumbed to the disease. Many of the highly susceptible species had completely disappeared three to four weeks previously. Typical curly–top symptoms such as dwarfing, vein clearing followed by chlorosis, and death were observed.

Only eight flowering ornamentals tested, belonging to six different families, did not show visible symptoms of the curly–top virus. Of the remaining 25 ornamentals,

which all showed definite symptoms of curly-top, 13 were highly susceptible and succumbed to the disease early in the season, representing six different families. The other 12, in seven families, constituted an intermediate group which exhibited varying degrees of disease expression and could possibly be recommended for planting during years when the beet leafhopper populations are low. Otherwise, only the eight resistant flowering ornamentals listed below can be recommended for planting in southern New Mexico.

Perennials

Babysbreath (*Gypsophila paniculata*) varieties Double and Single
Blanket Flower (*Gaillardia aristata*) variety Portala
Mourning Bride (*Scabiosa caucasica*) variety House's Giant
Poker Plant (*Kniphofia uvaria*)
Sea Lavender (*Statice latifolia*)
Beard Tongue (*Penstemon barbatus*)

Annual

Feverfew (*Chrysanthemum parthenium*) variety Snowball.

DIGEST OF PLANT QUARANTINE REGULATIONS: FIRST SUPPLEMENT

In advancing the objectives of the International Plant Protection Convention of 1951, a new edition of the Digest of Plant Quarantine Regulations, covering forty countries and territories, was issued in 1952 as FAO Agricultural Development Paper No. 23. In addition to providing a medium for circulating information on legislation governing the imports of plants and plant products, it was considered that a better mutual understanding among governments would stimulate the improvement of existing plant quarantine measures and would lead to fuller international co-operation in the field of plant protection.

The First Supplement to this publication will be published in May 1954 in multilithographed form. It will contain summaries of the plant quarantine legislation of thirty-six countries and territories which were not covered in the Digest, namely:

Antigua
Barbados
Bermuda
British Guiana
British Honduras
British Solomon Islands
British Virgin Islands
Cambodia
Costa Rica
Denmark
Dominica
Falkland Islands
Fiji
Gambia
Gilbert and Ellice Islands Colony
Gold Coast
Kenya
Maltese Islands
Mauritius
Montserrat
Nigeria
North Borneo
Northern Rhodesia
Saint Christopher and Nevis
Saint Helena
Saint Vincent
Sarawak
Sierra Leone
Singapore
Spain
Spanish Morocco
Sudan
Tonga
Trinidad and Tobago
Uganda Protectorate
Zanzibar Protectorate

The Digest and supplements are complementary to the plant quarantine announcements published in this Bulletin, with which they should be read. Further supplements will be issued from time to time to cover additional countries.

The First Supplement will be supplied to the plant protection services of all FAO Member Governments and will be obtainable from Plant Production Branch, Agriculture Division, FAO, Rome.

Progress in the Control of Olive Fly

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In accordance with the recommendations of the meeting on olive fly (*Dacus oleae*), convened by FAO in Florence, March 1953, co–ordinated experiments were carried out in Greece, Israel and Italy to investigate systematically the Berlese method and to test a few selected organic insecticides applied as cover sprays. The economic importance and biology of the olive fly and the known methods of its control were reported previously [1]. The present article is a brief summary of personal observations on the experimental results obtained in 1953 in Greece and Italy, and of some remarks on the merits and disadvantages of the two systems: the application of a poison bait described as the Berlese method versus the application of newer insecticides by cover sprays.

In the Berlese method, the insecticide used is composed of an aqueous solution of 0.25–0.3 percent sodium arsenite which is sweetened by the addition of molasses. Recent modifications proposed by A. Melis of Italy suggest that unrefined sugar, concentrated grapejuice or other sweet substances be used as a substitute for molasses. Basically a bait, this preparation is applied with knapsack sprayers on the central and upper periphery of the foliage with the nozzle set to discharge the solution in a jet stream. Generally, 300 to 500 grams of the solution should suffice to cover an average olive tree. At least six treatments are recommended at intervals of 20 to 25 days, the first application commencing when the young fruit changes from deep to pale green. Applications have to be repeated immediately if rain follows within 2 to 3 days after treatment and it was suggested that each treatment of a given area should be completed within 3 to 4 days. One of the most important prerequisites for the success of this method, a condition which is frequently ignored, is that a whole and continuous olive–growing area must be treated and not merely a few hundred trees. The method aims at killing the adult flies; once oviposition is permitted to take place the fruit will be largely destroyed. In the past, as is also true today, the investigators were not able to agree on the efficiency of this method. Some reported excellent results while others were confronted with almost complete failure, either in different years or in different regions.

Application of insecticides by cover sprays, although commonly used in orchards against insect pests and diseases, had not been introduced for the control of olive fly until very recently. The introduction of cover sprays aims at the protection of individual trees rather than of large areas and the degree of control in each treatment is in direct proportion to the thoroughness of the coverage.

Experimental Results

Berlese method. Applied in 1953 in extensive trials in Greece and Italy, this method gave, as was expected, variable results. In Tuscany, Italy, the treated groves were found, just before harvest, to be over 95 percent free from infestation while in adjacent untreated zones the infestation varied from 60 to 100 percent. In Sicily the results differed considerably; while the untreated regions were 60 to 100 percent infested, infestation in the treated regions was also 30 to 60 percent. The infestation in the treated groves in Sicily would have increased even further if the fruit had been left to ripen on the trees. In Greece, this method was applied in 1953 in the region of Pelion. Here, too, while infestation in the untreated zones varied from 20 to 80 percent, infestation in the treated regions was also from 3 to 40

[1] LOGOTHETIS, C. The olive fly in the Mediterranean region. *FAO Plant Prot. Bull.* 1: 118–120. 1953.

percent. In both instances the unsatisfactory results obtained by the use of this method have been attributed to the fact that either the treatments were not applied at the right time and properly or that there were not sufficient treatments.

Cover sprays. On the basis of the encouraging results of previous years, parathion, malathion, dieldrin, DDT and methoxychlor were tested in 1953 in various concentrations and formulations. As stated earlier, these experiments were intended to determine the efficiency of these insecticides in protecting individual groves or even only a few trees in a large orchard. Dieldrin, DDT, methoxychlor and malathion gave up to 95 percent clean fruits in some tests but only after at least 2 to 3 treatments and when used at relatively high concentrations, while in other tests the first three were completely ineffective and malathion caused injury to foliage and fruit. Parathion consistently gave excellent results, i. e., over 99 percent clean fruit (Fig. 1).

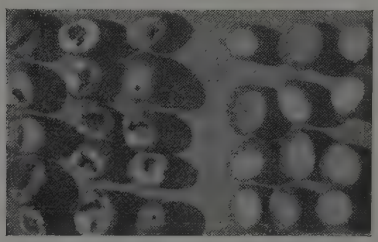

Fig. 1. *Olive fruit from trees treated with parathion in comparison with fruit damaged by olive fly from untreated trees.*

Parathion was used in various formulations (emulsion, suspension, dust), in concentrations varying from 0.03 to 2 percent and in 1 to 4 applications during the season. Of all these combinations the most practicable appears to be one application with 0.6 parts per thousand in the form of emulsion.

The efficiency of parathion is attributed to the fact that it penetrates the fruit readily, a factor which may prove disadvantageous because of its toxic residues. Before the fruit starts producing oil the insecticide disintegrates chemically within about 20 days after application, but once retained by the oil it has persisted for over three months and will probably remain unaltered for much longer periods. During the first few days after application it will kill the adult flies but its greatest value appears to be against the immature stages. It has ovicidal properties, but is most effective against the young larvae which are killed within 4 to 5 days after hatching and before they can cause any appreciable damage.

Comparison of the Two Methods

The use of parathion is only in the experimental stages and a great deal must be done before it can be recommended for general use. However, in view of the highly satisfactory results achieved thus far, it will probably find wide acceptance in olive fly control. The following paragraphs discuss some of the merits and disadvantages in the use of parathion as cover spray and in the Berlese method. It is recognized, however, that with the recent advances of organic chemistry parathion may eventually be replaced by even more efficient insecticides.

Berlese method. In areas where it proves successful this method is economical and can be easily applied with a conventional knapsack sprayer to almost all sizes of trees. Moreover, it eliminates the toxic residue problem and it is less dangerous to operators. On the other hand it presents certain disadvantages which prevent it from finding general acceptance:

(1) it has not given consistently satisfactory results;

(2) it requires at least six treatments and frequently even ten because treatments must be immediately repeated after rain;

(3) each application is effective for only 2 to 3 days and consequently great care must be taken in the timing of the treatments; fruit left unprotected even for 1 to 2 days after the emergence of a new generation may be completely destroyed;

(4) it is not effective after the commencement of the autumn rains; this will have a greater effect on late maturing varieties and in areas where the harvest is not completed until the following February or even March;

(5) since control operations have to be applied on a large scale and properly timed,

the work must be done by hired and well supervised personnel, and as a result the growers themselves do not actively participate in the protection of their own crop.

Parathion. Since parathion penetrates into the fruit within an hour after application and is retained there for a relatively long period, one treatment may be sufficient to give the necessary protection regardless of weather conditions. The farmer himself can protect his own property, even one tree, and need not depend upon synchronized large scale campaigns operated by hired crews working under expensive supervisory personnel. The insecticide needs to be applied only when considerable infestation becomes evident on productive trees. It would not be necessary to treat trees during "off–years" or trees which have only a light crop unworthy of harvesting. In addition to the protection against the olive fly, parathion also protects the olive tree from other pests such as scale insects and, in some areas, from the very important olive kernel borer (*Prays oleae* = *P. oleellus*).

Notwithstanding the numerous important advantages, parathion applications present certain difficulties which have yet to be overcome. Among these difficulties are:

(1) Parathion is effective only when used in the form of cover sprays, the application of which requires the costly power–driven equipment instead of the inexpensive knap–sack sprayers. And the use of the power–driven sprayers is not always possible on rugged or hilly lands nor practicable for tall trees.

(2) Thorough wetting of the foliage necessitates large quantities of water which may not be available during the dry periods of the year when it is needed most. This difficulty, however, may be partially overcome by the use of low–volume sprayers.

(3) Although parathion is not more poisonous than the white arsenic used in the Berlese method it is nevertheless more dangerous to operators because the finer droplets cannot be easily avoided and consequently greater prophylactic measures must be taken.

(4) The effect of toxic residue of parathion to humans from daily consumption of the fruit and oil from treated trees is a problem yet to be thoroughly investigated. The toxic residue tolerance of parathion on edible foods has been temporarily determined by the United States Food and Drug Administration as two parts per million. Although chemical analyses of fruit and oil from trees treated with parathion at the rate of 0.6 parts per thousand indicated a residue of no more than 1.6 parts per million, and bio–essay tests with domestic animals have proved these residues apparently harmless, the investigations should be repeated and continued further.

Discussion

The results of the 1953 experiments have again proved that the Berlese method cannot be relied upon to give satisfactory control against the olive fly under all conditions. It may give very satisfactory economic control in areas where the olives ripen early or are intended for oil. In the latter case the fruit may be harvested before it reaches full maturity and thus escapes the heavy infestations of the later insect generations. Moreover, since the high acidity of the oil resulting from infestation may be removed by the refining process, heavy infestations late in the season may be considered unimportant. However, it has not proved satisfactory in areas where the olives are intended for table use. It is also equally unsatisfactory when used in warmer areas where the insect has over six generations per year or even reproduces continuously throughout the year, and where the fruit is usually harvested late in the winter. These problems are now well understood and more efficient methods are being developed for each case. The co-ordinated experiments carried out in 1953 have laid the foundations for a new beginning, and it is anticipated that this work will continue until the desired results have been achieved.

The introduction of the use of the recent synthetic organic insecticides in the control of the olive fly has already given extremely encouraging results. Before a new method is developed and recommended, however, it will be necessary to establish the minimum effective dose, the number and timing of applications, the appropriate type of application equipment, and associated economic factors. The most important question which needs further and careful investigation is

that which concerns toxic residues and the poisonous effects, especially when such insecticides are used by inexperienced farmers.

There is every reason to encourage a very optimistic outlook with regard to the economic factors involved in the use of parathion. For the unexcelled results obtained, even at prevailing prices, one treatment with a dilution as low as 0.6 parts of the active material per thousand parts of water is relatively inexpensive and compares favorably with the Berlese method which often requires 9 to 10 treatments. Further reduction in expenditure would be attained by limiting treatments only to trees bearing an economic crop and by avoiding the organization of the usually expensive large-scale campaigns. The use of parathion would also greatly increase the income of the producer who, assured of complete protection of the trees up to harvest, could thin part of the produce for green olive marketing, a practice which, in turn, would result in better quality but of equal quantity of ripe olives. An additional factor which should not be overlooked is the productive utilization of the time of the grower himself and the psychological effect on the community when the protection of his crop could be undertaken by the grower instead of depending upon others to do such vital work on his property while he remains idle.

Outbreaks and New Records

Denmark

Statens Plantepatologiske Forsøg, Lyngby

THE present notes summarize briefly the highlights of the situation of plant pests and diseases in 1953. Weather conditions were generally favorable to crops. The resulting luxuriant growth is probably one of the factors responsible for the unusual appearance of nutritional disorders, such as manganese, copper and magnesium deficiencies. Distribution of manganese by spraying as a remedy proves economically profitable.

Cereal Crops

Oats were registered as a new host of *Cercosporella herpotrichoides*, the causal fungus of foot rot, which was also found in rye. Stripe rust (*Puccinia glumarum*) which had been extremely rare for many years, suddenly rose to economic importance, probably as a result of the introduction of non–Scandinavian varieties of wheat. Leaf stripe (*Helminthosporium gramineum*) and net blotch (*Pleospora teres*) both affecting barley also appeared prominently after many years of insignificance.

The stem nematode, *Ditylenchus dipsaci*, was found in rye for the first time since 1910, and also in rapeseed, onion, and *Primula*, in none of which had this nematode ever been observed before in Denmark. The oat nematode, *Heterodera major* (= *H. schachtii* subsp. *major*), was common in oats and barley; new varieties of considerable resistance give hope of diminishing the losses in future.

Root and Fodder Crops

The downy mildew (*Peronospora schachtii*), which was very harmful in 1952, appeared on sugar beet in a relatively mild form, infection being barely enough to produce results in spraying experiments carried out in beet fields very close to infection sources.

The beet leaf miner, *Pegomyia hyoscyami*, damaged beet leaves in a few places and spraying with parathion proved profitable. Attacks of swedes by the cabbage root worm, *Chortophila floralis*, were in some parts of the country more destructive than ever before. Control with aldrin showed some promise and in 1954 timing of the treatments according to the appearance of flies in breeding cages will be practiced on a large scale. *Cnephasia longana*, a Tortricid, was reported as a new pest of beets. The cabbage thrips, *Thrips angusticeps*, occurred on beets, swedes, and mustard. In some cases the infestation was found to be originated from flax fields. Control of this insect with parathion and HETP (tetraethyl pyrophosphate) showed promise.

On rapeseed the crucifer midge (*Dasyneura brassicae*) was very injurious to the pods. Outbreaks in 1953 appeared to be even more severe than usual. Control of this pest is difficult because the use of pesticides may kill bees as well. The occurrence of the stem nematode in this host has already been noted under cereal crops.

Fruits

Apple scab (*Venturia inaequalis*) was common and severe, making intensive spraying most profitable. *Dasyneura tetensi*, a midge previously unknown in Denmark, was found infesting black currants. The mite *Phyllocoptes fockeui* frequently damaged leaves and young shoots of plum, peach and apricot. Attack by this mite had not been observed before, but the damage caused in 1953 was sufficiently heavy to necessitate inspection measures.

(The above information was received from the European Plant Protection Organisation, Paris.).

United States

PAUL R. MILLER

Bureau of Plant Industry, Soils, and Agricultural Engineering,
United States Department of Agriculture

Potato Rot Nematode Discovered in Wisconsin

Information was received from the Economic Insect Detection and Reporting Section of the Bureau of Entomology and Plant Quarantine that the potato rot nematode (*Ditylenchus destructor* Thorne) had recently been found in a potato growing area in Langlade County, Wisconsin. Techniques for determining the presence of this nematode have been established and a comprehensive survey is now in progress to ascertain the extent of the infestation. Regulations have been put into effect to prevent movement of potatoes from infested premises and other sanitary safeguards have been instituted. The nematode is known to occur in the United States in only one other State, namely Idaho, where it was discovered in 1943.

INTERNATIONAL PLANT PROTECTION CONVENTION: ITS PRESENT STATUS

Since the approval of the International Plant Protection Convention by the FAO Conference in 1951, thirty-seven governments have signed it and three governments have adhered to it. Among these governments, nineteen have deposited with the Director-General of FAO the instruments of ratification, the instruments of adherence, or statements to the effect that ratification is not required in accordance with their legislative procedures. The Convention came into force for these Governments on the following dates when such instruments or statements were received:

Australia	27 August 1952
Austria	22 October 1952
Belgium	22 July 1952
Cambodia	10 June 1952
Canada	10 July 1953
Ceylon	12 February 1952
Chile	13 March 1952
Denmark	13 February 1953
Dominican Republic	20 June 1952
Egypt	20 July 1952
El Salvador	12 February 1953
India	9 June 1952
Japan	11 August 1952
Korea (Republic of)	8 December 1953
New Zealand	16 September 1952
Philippines	3 December 1953
Spain	18 February 1952
Sweden	30 May 1952
United Kingdom	10 August 1953

PLANT QUARANTINE ANNOUNCEMENTS

Australia

Quarantine Proclamation No. 52A, published in the *Commonwealth of Australia Gazette*, 31 August 1953, prohibits or restricts the importation of certain articles and certain animal products likely to introduce diseases or pests affecting animals or plants. This Proclamation revokes Quarantine Proclamation No. 50A of 26 June 1952.

Among the articles and animal products whose importation is either prohibited absolutely or restricted by this Proclamation, the following are either of plant origin or of concern to plant production.

Imports prohibited.

1. Used and second-hand beehives.
2. Animal manure, other than guano.

Imports restricted. The articles or products listed below may be imported only from countries specified and shall be subject to such treatment and requirements as are prescribed by the Quarantine (Animals) Regulations. Such articles or products shall not be imported on a vessel used in navigation by air.

1. Fertilizer and stock feed of animal or fish origin, permitted only from New Zealand;
2. Fodder, hay, chaff and straw, permitted only from New Zealand;
3. Straw packing and other unprocessed vegetable packing with goods, permitted only from New Zealand and U.S.A.;
4. Used or second-hand bags (including woolpacks and bagging) other than bags containing merchandise, permitted only from New Zealand and the U.S.A., if they have not been used in other countries.

In addition to the above, a number of animal products and articles in relation to the care of animals are listed in this Proclamation subject to these restrictions.

Italy

Ministerial Decree of 18 September 1953, published in the *Gazzetta Ufficiale* No. 218, 23 September 1953, on which date it came into force, provides measures for the protection of sugar beet cultivation against the beet weevil (*Temnorhinus mendicus* Gyll. = *Cleonus mendicus* Gyll.). Since many beet-growing areas in Italy are still free from this pest, it is considered necessary to prevent its further spread.

The present Decree prohibits the importation into Italy and movement across its territory of sugar beet plants or parts thereof, except glomerules. It also prohibits the transport of such plants or parts of plants from communes declared to be infested by the beet weevil to non-infested communes.

Uganda

General Notice No. 1344 of 24 December 1953 summarizes the more important provisions of General Notice No. 500 (The importation of plants into Uganda) of 1949, No. 982 (Importation of fresh fruit and vegetables) of 1950, and No. 814 (Importation of fresh fruit) of 1951.

An import permit is required for the introduction into Uganda of any living plant or part of a plant. The permit, obtainable from the Senior Entomologist, Kawanda Research Station, Kampala, will specify conditions to be fulfilled by the importer. In most cases, each consignment will require a certificate of inspection and freedom from signs of pests and diseases issued by the country of origin. No soil may accompany plants. Tobacco seed should be disinfected before arrival and clover seed should be certified free from dodder.

Most seeds are exempted from the requirement of a permit, provided that they are in individual packets of not over 1 lb. in weight. The schedule of seeds requiring permits is as follows.

Coffee	Rubber
Cotton	Maize
Tobacco	Clove
Tea	Peach
Cacao	Barberry
Coconut	Buckthorn
Groundnut	Potato
Lucerne	Sunflower
Clover	

Owing to the danger of introducing tomato spotted wilt disease, permits will not be granted for ornamental bulbs or herbaceous plants other than from Kenya and certain parts of Southern Rhodesia. However, carnations, gladiolus, daffodil and related bulbous plants will be allowed importation from the United Kingdom or Holland, if accompanied by certificates issued by the Ministry of Agriculture of the United Kingdom or Holland certifying that the plants were inspected during growth and found free from spotted wilt. At present permits will not be issued for dahlias, *Nicotiana*, *Begonia*, chrysanthemums and arum

lilies from anywhere but Kenya, except as seeds. All herbaceous plants from Tanganyika are banned.

The import permit is not at present required for cut flowers nor for most fresh food products, such as grain, potatoes and onions. It is, however, required for the introduction of fresh vegetables and fruit for consumption, except those imported by land or water routes from the neighboring territories of Kenya, Tanganyika, Zanzibar, Ruanda–Urundi, the Kibali–Ituri and Kivu Provinces of the Belgian Congo and the Equatoria Province of the Sudan. No permit will be granted for importation of fresh fruit from Asia, owing to the danger of introducing the oriental fruit fly.

NEWS AND NOTES

Commonwealth Entomological and Mycological Conferences

The Sixth Commonwealth Entomological Conference and the Fifth Commonwealth Mycological Conference will be held in London, 7–16 July and 16–24 July 1954 respectively. All the overseas Governments of the British Commonwealth and certain Government Departments of the United Kingdom are invited to attend.

These Conferences, held at five–yearly intervals, present an opportunity for specialists to discuss recent developments in the fields of entomology and plant pathology, to consider the projects carried out on behalf of the contributing Governments by the Commonwealth Institute of Entomology and the Commonwealth Mycological Institute, and to plan for future work. Included in the provisional agenda are also items of extreme importance, such as the supply and training of taxonomists, estimation of losses from pests and diseases and plant quarantine problems. The printed program giving full details of the Conferences will be issued later.

Plant Protection Agreement in Mexico and Central America

During the last Conference of Ministers of Agriculture of Mexico and Central America, held in San Salvador in October 1953, an agreement to establish a regional plant and animal protection agency was signed by the seven participating Governments, namely, Costa Rica, El Salvador, Guatemala, Honduras, Mexico, Nicaragua and Panama. The functions of the projected agency will be mainly as follows:

1. to undertake investigations with regard to the control of important pests and diseases affecting plants and animals;
2. to coordinate control programs in the region;
3. to advise the Governments on the standardization and unification of quarantine measures.

Previously two agreements of limited scope were established and are still in force in the Mexico–Central American region: one on locust control and another on foot–and–mouth disease. As a result of the former, an International Committee of Coordination for Locust Control was created in 1949 and has made commendable progress since then. However, the need for an agency to assume the over–all responsibility in the field of plant and animal protection has long been felt by the Governments concerned. The projected agency, which will come into official being after the agreement on plant protection has been ratified by four of the signatory Governments, will integrate all the related activities, including locust control and foot–and–mouth disease.

Roma - Tip. del Senato del dott. Giovanni Bardi

SOME FAO PUBLICATIONS

***Soil Surveys for Land Development*, 1953, xii+110 pp. $ 1.00, 5s.**

Sufficient of the techniques of soil classification and mapping are outlined so that the mode of operation, the type of equipment involved and the cost of the work can be accurately assessed.
Maps in colour. Good bibliography.

***Legumes in Agriculture*, 1953, xiii+367 pp. $ 3.00, 15s.**

More than the other successful FAO symposia (*Soil Conservation, The Efficient Use of Fertilizers* and *Improving the World's Grasslands*) this monograph brings together material nowhere else available in one place.

***Agricultural Development and Rural Reform in Denmark*, 1953, vii+320 pp. $ 3.00, 15s.**

FAO is now giving considerable attention to land tenure problems.
This monograph covers not only the subject of land tenure, but also several aspects of agricultural development in Denmark closely associated with this subject, so that it can be considered as a significant contribution to the work of FAO in this field.

***Improving the World's Grasslands*, 1951, 147 pp., 107 illustrations, 12 tables. 10s.**

"It is an important contribution to the subject; the general reader will find it of interest, while the specialist will find it invaluable".
Review in *World Crops*.
(Published for FAO by Leonard Hill Ltd., 9 Eden Street NW, London, England)

***Weed Control by Growth-Regulating Substances*, 1951, iii+35 pp., 5 illustrations, 2 tables. Third English printing. $ 0.50, 2s. 6d.**

All three editions of this short book have sold rapidly and the Spanish and French editions have been serialized in the agricultural press.

***Efficient Use of Fertilizers*, 1949, 182 pp., 50 illustrations, tables, maps, charts. $ 2.00, 10s.**

This guidebook on fertilizers and their use in crop production is one of FAO's bestsellers. The Spanish edition, which has been serialized six times in Latin America and Spain, is now in its second printing. The English edition has been reprinted commercially by Leonard Hill Ltd., London.

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